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Research Article

ASSOCIATION BETWEEN DIABETES MELLITUS AND HYPOTHYROIDISM AND ITS CO-RELATION TO DYSLIPIDEMIA IN PATIENTS ATTENDING A TERTIARY CARE HOSPITAL

Amandeep Kaur*

Biochemistry Department, Gian Sagar Medical College and Hospital, Banur, Patiala

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ABSTRACT

Background: Diabetes Mellitus and hypothyroidism are major endocrine disorders leading to secondary disorders. Hypothyroidism and Type2 (T2DM) diabetes are both associated with increase in triglyceride levels. Here, our study was conducted in region around Gian Sagar Medical College and hospital and we found the typical cases of type2 diabetes mellitus and hypothyroidism i.e. elevated TSH, FBS and TG levels.

Objectives: The study aimed at determining the incidence and prevalence of thyroid dysfunction in patients with T2DM and dyslipidemia in relation to age, sex, metabolic syndrome and other comorbid conditions.

Research designs & methods: In this observational cross-sectional study, total 200 subjects were enrolled aged between 40 and 75 years in which 100 were control subjects (group A) and 100 were Type 2 DM patients (group B). Both the groups were evaluated for TSH, fasting blood sugar (FBS) and serum triglycerides. The observations and interpretations were recorded and results obtained were statistically analyzed.

Results and conclusions: A high prevalence of thyroid dysfunction was observed in type 2 diabetic patients with dyslipidemia. Thyroid dysfunction was more prevalent in diabetic patients, with presence of dyslipidemia and it is a significant contributing factor for metabolic syndrome. The two groups categorized one as Control study (group A) and another as Cases study (group B) for estimation of TSH, TG and FBS. The results were found to be statistically significant with p value less than 0.0001 in all the three parameters. The serum TSH, TG and FBS were profoundly higher in case study group as compared to the normal subjects. Subclinical hypothyroidism needs to be screened among diabetic patients.

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INTRODUCTION

Diabetes mellitus (DM) is the most common group of disorders presenting to our endocrine services, followed by thyroid disorders. Association of autoimmune thyroid disorders with type1 diabetes is well known. According to WHO, the past report says that the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014. Diabetes prevalence has been rising more rapidly in middle- and low-income countries. Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation. In 2015, an estimated 1.6 million deaths were directly caused by diabetes. Another 2.2 million deaths were attributable to high blood glucose in 2012. Almost half of all deaths attributable to high blood glucose occur before the age of 70 years. WHO

projects that diabetes will be the seventh leading cause of death in 2030 (WHO, 2017). Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are ways to prevent or delay the onset of type 2 diabetes. Diabetes can be treated and its consequences avoided or delayed with diet, physical activity, medication and regular screening and treatment for complications.

The number of Americans with diabetes will double in the next 25 years from 23.7 million in 2009 to 44.1 million in 2034. A person with hypothyroidism may be at risk for metabolic syndrome or insulin resistance, both of which could lead to type 2 diabetes. Low thyroid function is a risk factor for diabetes, especially in individuals with prediabetes. Type 2 diabetes patients are more likely to have subclinical hypothyroidism when compared with the healthy population and subclinical hypothyroidism may be associated with increased diabetic complications. It is necessary to screen

*Corresponding author: **Amandeep Kaur**

Biochemistry Department, Gian Sagar Medical College and Hospital, Banur, Patiala.

thyroid function in patients with type 2 diabetes. (Hotze, 2017). The aim of our study is to make awareness to diabetes patients that subclinical hypothyroidism may become an uprising complication which can intervene in dyslipidemia might be due to autoimmune cause. So, screening of thyroid dysfunction is vital to avoid the complications.

Experimental Section

MATERIAL AND METHODS

Subjects: The present studies comprised of 200 subjects and were divided into two groups; one as control group A and second as cases group B. The selected patients were either attending OPD or admitted in the hospital. The patients were enrolled for the study after informed consent and approval from ethics committee of the institute. The study protocol was approved by the ethical committee of Gian Sagar Medical College and Hospital. A detailed clinical history was taken which was correlated with the hypothyroid, hyperthyroid conditions and diabetic patients.

Blood Samples : Samples were drawn after 12 h of overnight fasting and serum was separated for various parameters i.e. TSH, TG and plasma sample for Fasting blood sugar sample .TSH levels were assayed by immunofluometric assay on AIA-360 procured from Tosoh corporation Tokyo, Japan (ref. range: 0.25-5.25µIU/ml). The glucose levels were estimated on Mindray BS 400 autoanalyzer by glucose oxidase-peroxidase method (range of testing: 5.4-504mg/dl) with reagents, calibrators, and controls from Shenzhen Mindray biomedical electronics. Serum triglycerides were also analyzed on Mindray BS 400 autoanalyzer by an enzymatic colorimetric method (range of testing: 8.75-1093mg/dl) involving lipoprotein lipase, glycerol kinase, glycerol-3-phosphate oxidase and finally in the presence of peroxidase (POD), hydrogen peroxide oxidizes aminoantipyrine and N-ethyl-N-(2-hydroxy-3-sulfopropyl) - 3-methylaniline into a red compound. Statistics The means and standard deviations were calculated and paired t-test was used to calculate P values.

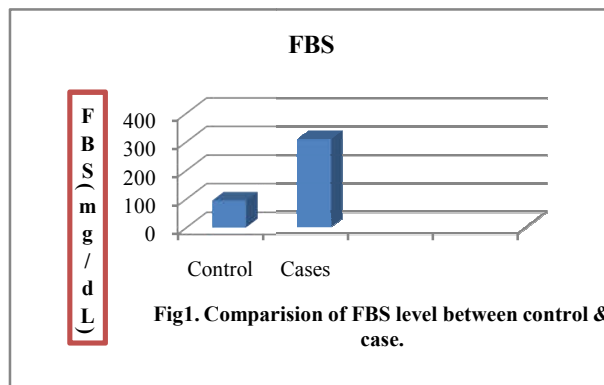
RESULTS

The patients were divided into two groups. One as Control group A and another as Cases group B. In cases group the levels of serum TSH, TG and FBS were significantly higher as compared to the control group with the p value <0.0001. The statistical analysis has been shown in Table 1 which reveals the results are statistically highly significant.

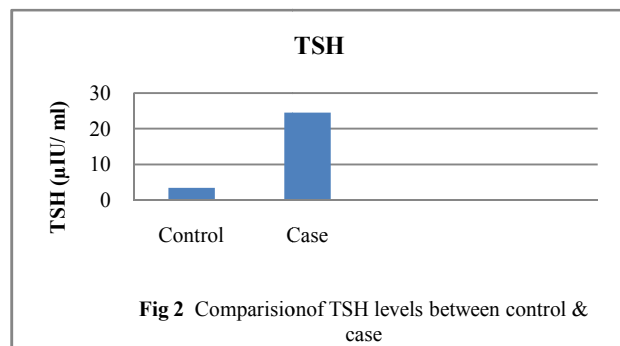
The figure 1 shows the comparison of the plasma FBS levels in the categories of control and cases groups. The FBS levels in diabetic patients were alarmingly high as compared to the normal subjects and p value was found to be statically significant <0.0001, with t value 23.7.

Table 1 Comparison of levels of TSH, FBS and TG Parameter between control & Cases

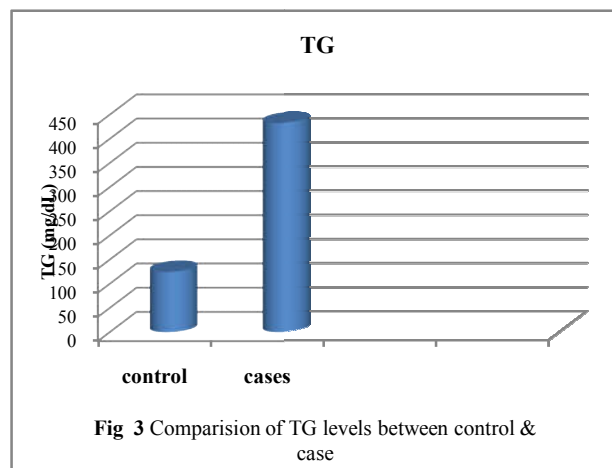
Parameters	Control Group-A (Means ± S.D)	Cases Group-B (Means ± S.D)	p Value	T Value
TSH (µIU/mL)	3.4 ±1.5 SEM=0.150	24.5±16 SEM=1.6	< 0.0001	12.6
FBS (mg/ dL)	95.2±15 SEM=1.5	309.1±89 SEM=8.9	<0.0001	23.7
TG (mg/dL)	125.2±20 SEM=2.0	432.2±98 SEM=9.8	<0.0001	30.6



The figure 2 shows the comparison of the serum TSH levels in both the groups, i.e. control and cases study group. The TSH levels in diabetic patients were extremely high as compared to the normal subjects and p value was found to be statically significant <0.0001, with t value 12.6.



The figure 3 shows the comparison of the serum triglyceride (TG) levels in both the groups of study. The TG levels in diabetic patients were profoundly high as compared to the normal subjects and p value was found to be statically significant <0.0001, with t value 30.6.



DISCUSSION

Diabetes and thyroid disorders have been shown to mutually influence each other and associations between both conditions have long been reported (Freely *et al* and Grey *et al*, 1979). On one hand, thyroid hormones contribute to the regulation of carbohydrate metabolism and pancreatic function, and on the other hand, diabetes affects thyroid function tests to variable

extents. This paper demonstrates the importance of recognition of this interdependent relationship between thyroid disease and diabetes which in turn will help and guide clinicians on the optimal screening and management of these conditions. (Hage *et al*, 2011). Patricia Wu in 2000, made the notion that diabetic patients have a higher prevalence of thyroid disorders compared with the normal population and stated statically the division. Thyroid disease in general population is 6.6%.

Thyroid disease in diabetes has overall prevalence: 10.8-13.4%, Hypothyroidism: 36%, Subclinical hypothyroidism: 5-1.3%, Hyperthyroidism: 12%, Postpartum thyroiditis: 11%. Wu explained the screening criteria which can be boon for diabetic patients. In type 1 diabetic patients, it is helpful to determine whether anti-TPO antibodies are present. If these are present, then annual TSH screening is warranted. Otherwise, a TSH assay should be done every 23 years. In type 2 diabetic patients, a TSH assay should be done at diagnosis and then repeated at least every 5 years. Park *et al* in 2005, not only correlated the hypothyroidism with type 2 diabetes but also associated type V hyperlipoproteinemia along with eruptive xanthoma.

In 2010, Brenta recognised thyroid hormones, have marked effects on glucose homeostasis. He emphasised autoimmune thyroid disease is more prevalent in diabetic patients type 2 are more prone to sub-clinical forms of hypothyroidism and should be ruled out since they may be associated with higher cardiovascular risk. A similar study was done by Singh *et al* in 2010. Ghazali and Abbiyesuku in 2010, explained thyroid dysfunction as the culprit of the metabolic derangement in Diabetes Mellitus (DM). It is necessary to recognize and treat it when present in order to achieve stability of metabolic control. Gebel in 2011, described diabetes and thyroid disease are caused by a hormone imbalance, although the hormones involved are different. Thyroid disorders are typically related to either an overproduction of thyroid hormones (hyperthyroidism) or, more commonly, an underproduction (hypothyroidism). Studies done by Hage *et al* in 2011, have found that diabetes and thyroid disorders tend to coexist in patients. Both conditions involve a dysfunction of the endocrine system. Thyroid disorders can have a major impact on glucose control, and untreated thyroid disorders affect the management of diabetes in patients. Consequently, a systematic approach to thyroid testing in patients with diabetes is recommended. Demitrost in 2012 in his retrospective study among people living in Manipal, Indian population. Reported that Type 2 diabetes mellitus (DM) is a growing problem and observed that many patients are associated with thyroid dysfunction later in their life. Shekhar *et al* in 2012, reported clinical relationship of Diabetes Mellitus and hypothyroidism. Wang in 2013 gave the idea that Hyper- and hypothyroidism both were associated with insulin resistance which had been reported to be the major cause of impaired glucose metabolism in T2DM. Al-Geffari in 2013, in cross sectional study reported Thyroid Dysfunction as risk factor among Type 2 Diabetic Patients in a Highly Diabetes Mellitus Prevalent Society. His work significantly highlighted that Thyroid dysfunction is highly prevalent among Saudi Type 2 diabetic patients, and the most significant risk factors are family history of thyroid disease, female gender, and >10 years duration of diabetes. Witting *et al* in 2014, in their retrospective study has similar

view about this endocrine disorder and both these diseases co-exist and came to conclusion that Thyroid disease might be a marker of a distinct metabolic trait in type 2 diabetes potentially requiring earlier insulin treatment. Han C in 2015 reported DM patients are more likely to have subclinical hypothyroidism (SCH) when compared with healthy population and SCH may be associated with increased diabetic complications. It is necessary to screen thyroid function in patients with T2DM, and appropriate individualized treatments in addition to thyroid function test should be given to T2DM patients with SCH as well. All these studies support our present study. In another study in 2015, Gronich *et al* in their cohort study indicated hypothyroidism as a risk factor for newly diagnosed Diabetes. Moreover, he also indicated Statin as another cause for onset of diabetes. In an another study in patients of gestational diabetes, Parham *et al* 2015, observed that patients with (Gestational diabetes Mellitus) GDM, hypothyroidism (clinical and subclinical) was obviously higher, the mean serum TSH level was higher in these women, and it was within a range that required treatment. So, it was suggested strongly for screening and treatment of hypothyroidism in patients with gestational diabetes. In 2016, Chaker *et al*, reported that Low and low-normal thyroid function are risk factors for incident diabetes, especially in individuals with prediabetes. Ajaz Ahmad *et al*, in 2017 in their case control study explained well for the correlation of diabetes and thyroid function as the endocrine dysfunction. Their study showed high prevalence of thyroid dysfunctions in diabetic patients and recommended for screening of thyroid function during diabetes and it may be an indicator for early diabetes. Seo *et al* in 2017, opined that individuals with early T2DM are presumed to have a low incidence of thyroid cancer. Early detection and well control of diabetes may affect not only management of diabetes but also incidence of thyroid cancer along with the assessment among individuals with chronic disease.

Qi *et al* in 2017, reported Subclinical hypothyroidism (SCH) as typically feature of elevated serum concentration of thyroid-stimulating hormone (TSH). This study aimed to determine the relationship between TSH levels and microvascular complications in type 2 diabetes patients. This study correlates our study that type 2 diabetic patients with higher TSH values had a higher prevalence. Brampari *et al* in 2017 emphasised for Screening for thyroid disease among T2DM patients in routine, as it is found to be an additional commorbidity. If it remains undiagnosed, it could aggravate the clinical course of the disease. His screening work was on Greek patients. Ozair in 2018, in his cross-sectional study observed, a high prevalence of thyroid dysfunction (28%) in type 2 diabetic patients with subclinical hypothyroidism (18.8%) as the commonest thyroid disorder. In addition to glycemic status, screening of thyroid disorder should be routinely done in type 2 diabetic subjects along with other comorbid conditions. Pramanik *et al* in 2018 screened and came to conclusion that almost one in four people living with diabetes are suffering from thyroid disease. Thus, routine screening should be implemented. Salt iodination program is a huge success in this part of the country. He did the study in type 2 diabetes, attending a tertiary care hospital in eastern India. Since decades, there has been a significant correlation between hypothyroidism and diabetes mellitus. It has been proved in various studies by different researchers all

over world. So, in the present study also, the findings were parallel to it.

CONCLUSION

In my present study, the results analysis was found to be significant. The serum TSH, TG and plasma FBS levels of case study were significantly high as compared to the control group individuals with the p value less than 0.0001. So, subclinical hypothyroidism must be screened for pre-diabetic as well as diabetic patients to avoid the complications as it has inter-linked metabolic connections.

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